

# Brownfield Remediation – Analysis and Modeling Assumptions

## Introduction and Purpose

The *GO TO 2040* plan, due to be complete in 2010, will make recommendations for policies, strategies, and investments needed for northeastern Illinois to reach its potential. For the plan to be viable, it is critical that the *benefits* and *costs* of these recommendations be understood. This document is part of a series that begins to analyze potential plan recommendations in this context by developing “sample programs” for the implementation of potential plan recommendations.

In this case, a “sample program” for brownfield remediation was developed involving the annual expenditure of \$23 million in public funds to remediate brownfield sites in the region’s most disadvantaged communities. The remainder of this document, and the accompanying presentation, describe how this “program” was developed.

Before reviewing the remainder of this document, please read the following notes, which explain its purpose and limitations.

- **Implementation:** This document does not address the responsibility for implementing the “sample program” described here. This is a very important consideration and will be addressed as a next step.
- **Scenario context:** Brownfield remediation will not be pursued in the absence of other strategies. CMAP recognizes that the benefits of the strategy are magnified when linked with full redevelopment of brownfield sites, job creation programs, and infrastructure investments, among others. As a later step, brownfield remediation will be analyzed along with these other strategies; but for this series of documents, CMAP is attempting to isolate and examine the benefits of individual strategies.
- **Site specificity:** The results of this analysis are not accurate at the parcel level, and further geographic detail beyond what is shown in this document cannot be given.
- **Assumptions:** To perform the analysis of the “sample program” described here, assumptions were made for appropriate locations, unit costs, and others. The purpose of this document is to allow these assumptions to be discussed and questioned, but please note that *some* assumptions must be made for any analysis to be possible.

The purpose of the analysis and modeling exercise is to determine, on a regional scale, where brownfield remediation would occur under the “sample program,” how much such a program would cost, how many brownfields would be remediated through the program, how the program would affect job and household distribution, and how it would impact key indicators.

## Key Assumptions

Any regional analysis and modeling process involves making generalities and assumptions. These assumptions were based on available literature and/or interviews with regional and national experts. Assumptions were a part of three stages in this analysis:

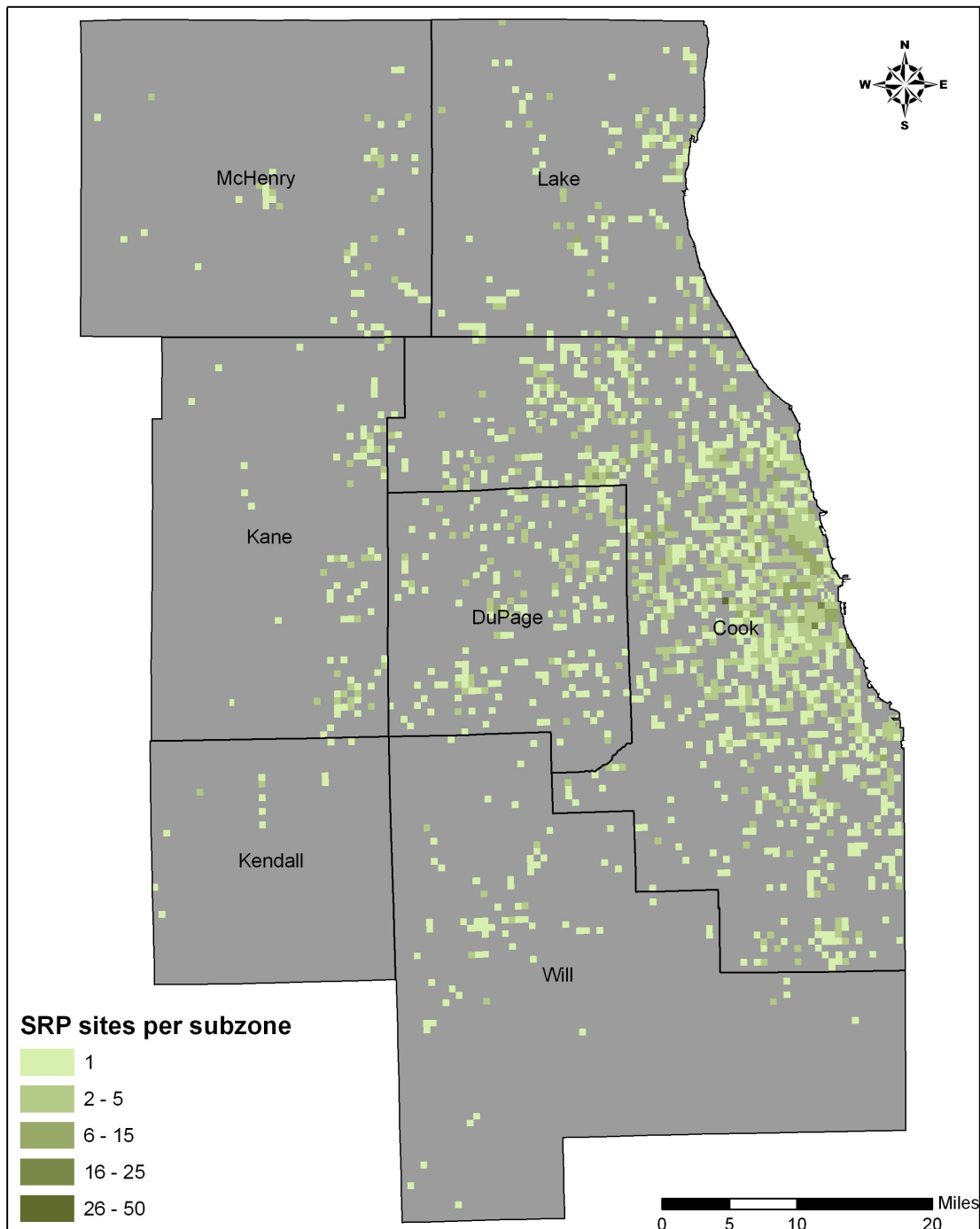
- Defining potential brownfields in the region which will receive public funding through the sample program;
- Determining how much these potential brownfields will cost to remediate; and
- Determining the impact of remediating and redeveloping these brownfield sites.

The assumptions within each of these stages of analysis will be fleshed out in greater detail below.

# 1. Defining the potential brownfields in the region which receive public funding through the sample program.

The methodology for how potential brownfields were identified is described in detail in the preceding strategy report (see [Section 2: Existing Conditions](#), and [Appendix](#)). Identified and cleaned-up brownfields from IEPA's Site Remediation Program (SRP) were mapped first. There are over 3,000 sites in the state's SRP, Table 1 shows a breakdown by county.

**Map 1: SRP Sites (Cleaned-up Brownfields)**

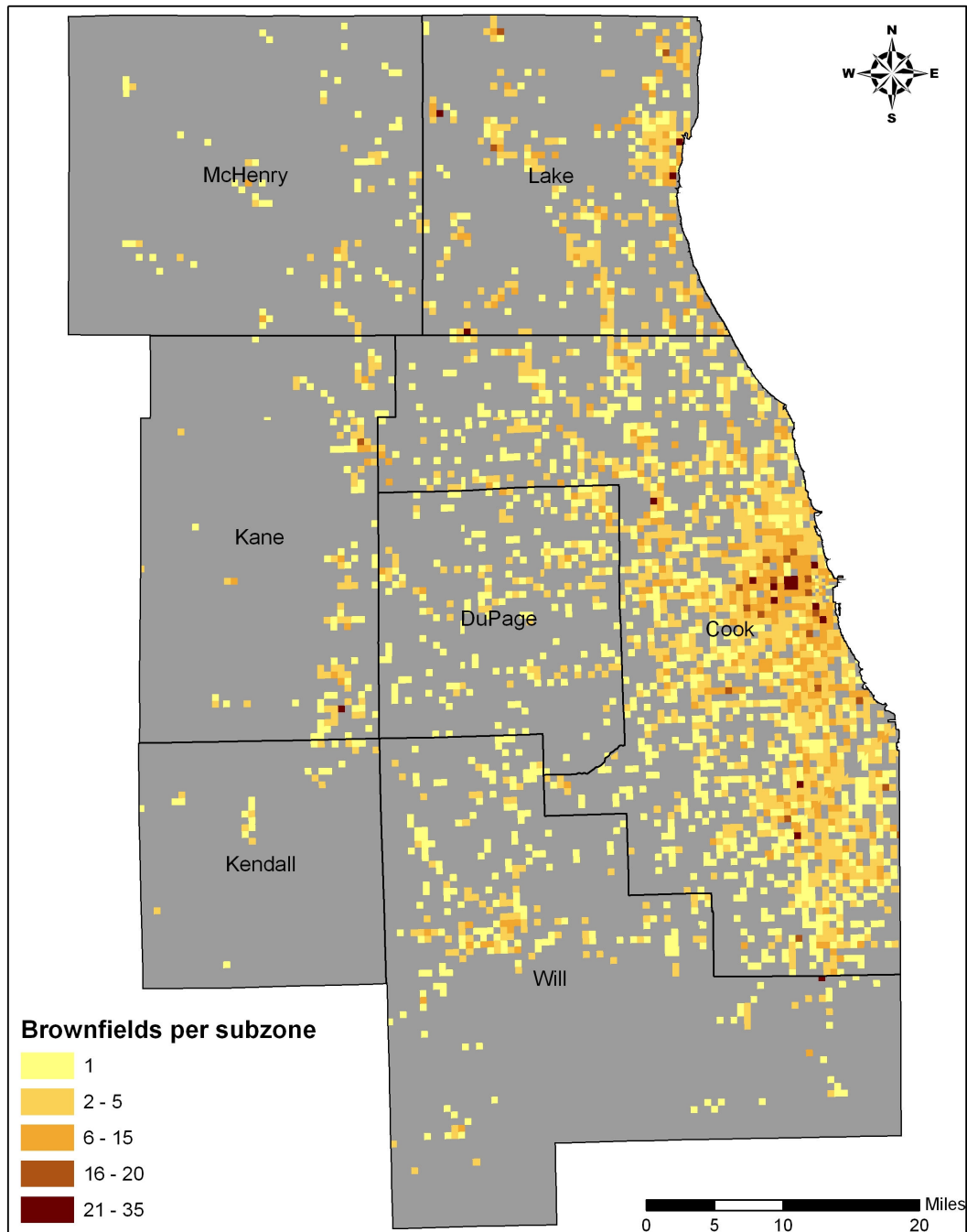


**Table1: SRP Sites in Region (1996-2007)**

County	Sites
Cook	2,254
DuPage	278
Kane	119
Kendall	16
Lake	200
McHenry	75
Will	87
Regional Total	3,029

Next, potential brownfield sites were mapped in a two step process. First, three US EPA data sources of potential contamination (TRI, RCRAinfo, and LIT) were mapped across the region. According to interviews with regional experts as well as US EPA data managers, these databases are good indicators of potential contamination on a parcel. Second, because these databases also include active businesses, the data was screened out by selected vacant and publicly-owned land. The resultant map (Map 2) portrays potential brownfield sites existing throughout the region. It reveals an approximation of sites with potential contamination that aren't currently occupied. But many of these are brownfields that have not yet been identified as such.

**Map 2: All Potential Brownfields**



As to be expected, there are higher concentrations of potential brownfield sites in the older, more urbanized areas; but the map reveals that the problem is pervasive. Table 2 shows the number of potential brownfield parcels by county, with a total of over 8,000 for the region.

<b>Table 2: Potential Brownfields in Region</b>	
County	Parcels
Cook	5,780
DuPage	411
Kane	324
Kendall	50
Lake	931
McHenry	156
Will	543
Regional Total	8,195

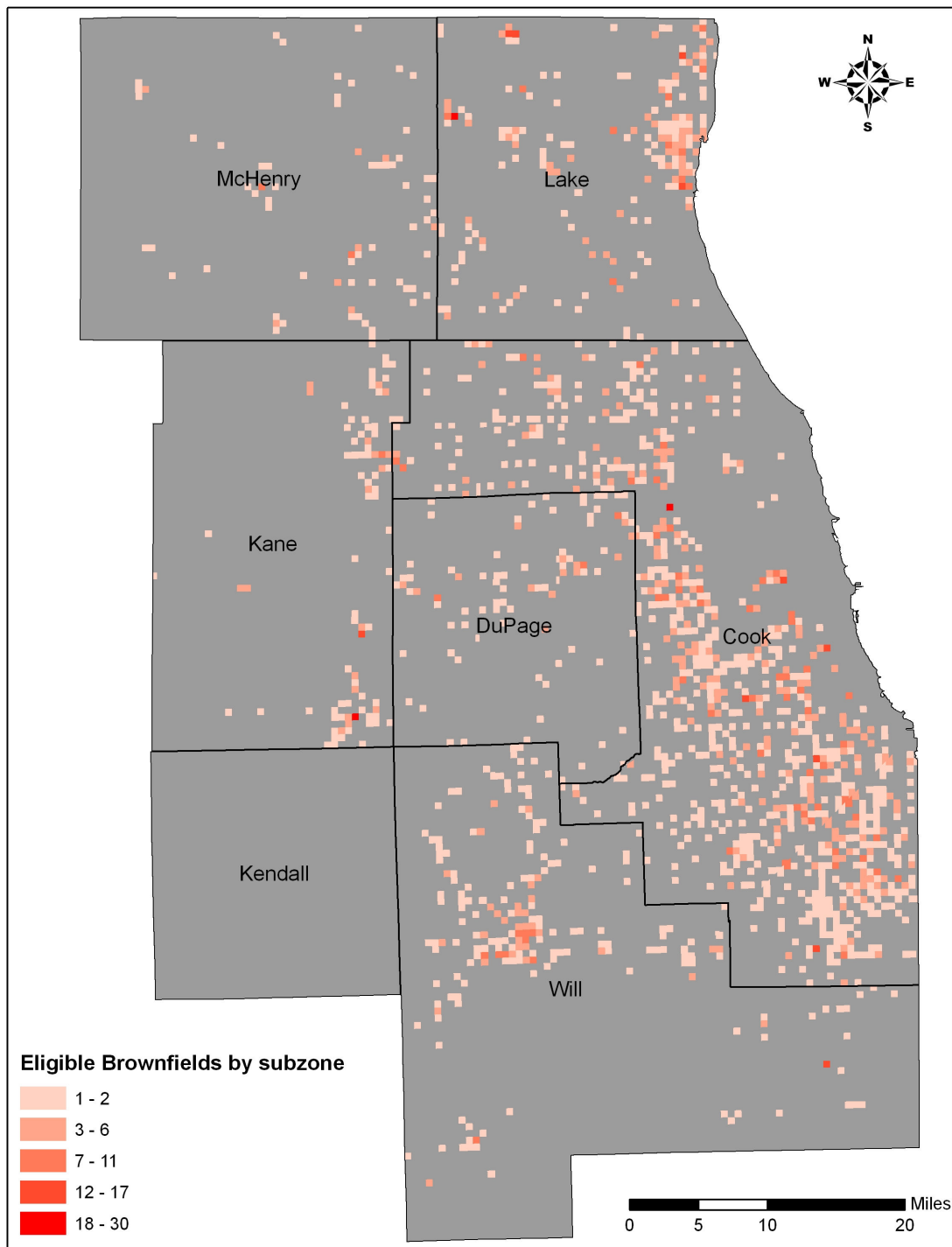
Of the potential brownfield sites identified, however, not all will rely on public funding for remediation. Estimates of the percentage of brownfields receiving public funding vary. One study found that about 55% of sites have some sort of public funding<sup>1</sup>; furthermore, a CMAP review of a sample of NFR recipients during 2005 found that roughly a third had some sort of public financing. Given these two findings, CMAP staff has chosen a conservative estimate of 45% as a percentage of brownfield sites receiving public funding. In other words, 55% of brownfields in the region are expected to be remediated without any public funding.

The final step was to determine the location of the potential brownfields that would receive public funding as part of the sample program, termed “eligible” brownfields. This involved estimating which brownfield sites would not require public funding to redevelop, or those sites which are in locations more favorable for redevelopment. This was done by screening out by those sites in locations with high land value and/or high growth areas. It was assumed that the return on investment of these sites would be sufficient enough for the private sector to shoulder the costs of remediation, and therefore not require public funding in the sample program.

The resultant map of “eligible” brownfields, portraying potential brownfield sites not in high growth areas or high land value areas, is below (Map 3). The sample program is based on targeting these sites. Table 3 tallies the number of sites by county, revealing a total of approximately 3,441 “eligible” brownfield sites in the region.

<b>Table 3: “Eligible” Brownfield Sites in Region</b>	
County	Sites
Cook	1,967
DuPage	168
Kane	215
Kendall	0
Lake	572
McHenry	119
Will	400
Regional Total	3,441

<sup>1</sup> DeSousa, C., “Residential Development Activity on Urban Brownfields in Milwaukee and Chicago: An Examination of Redevelopment Trends, Developer Perceptions, and Future Prospects,” September 2006. This study found that 45 percent of brownfield sites in Milwaukee and Chicago received no public financing.

**Map 3: Potential Brownfields Eligible for Public Funding**

Comparing this map to Map 2: All Potential Brownfields, several subzones have been eliminated; these are the subzones which are predicted to see future growth and/or have high land values, and therefore would not receive public funding as a part of this sample program. The resultant subzones or “eligible” sites will be the target of the sample program.

## 2. Determination of how much it will cost to remediate the targeted brownfields.

Determining an average cost for remediating a brownfield site across the region is difficult. In addition to the expense of land acquisition, costs range greatly depending on how much is known about the history of the site, the planned final use, and what type of contaminants (if any) need to be cleaned up. Each site is unique, and costs vary accordingly. But in order to develop a sample program, an “average” brownfield site has been created for this modeling exercise. Therefore, the results make sense on a regional level, but cannot be accurately scaled down to a local level. In addition, for the purpose of this sample program, cost estimates were focused on assessment and remediation of the site, not redevelopment. So costs like sampling, clean-up, and site preparation were included, but construction costs were not.

Using available data<sup>2</sup>, a median remediation cost of \$800,000 was estimated per site. However, this doesn’t separate private and public investment. As explained in the strategy report ([Section 4: Impacts, Economic Impacts](#)), studies suggest that approximately 25% of financing for brownfield clean-up is public funding. This means that an estimated \$200,000 of public funding and \$600,000 of private funding is involved per site.

The other component in developing the brownfield “program” is determining how many sites can be cleaned-up per year. Using NFR letters<sup>3</sup> as a proxy, there are approximately 173 sites cleaned up per year. This is according to an IEPA database tracking NFR recipients for the last ten years. As described above, approximately 45% of sites receive some sort of public funding. Therefore, approximately 78 sites receiving public funding will be cleaned up (receive a NFR letter) each year.

From these estimates, a sample program was developed that takes a more aggressive approach, increasing publicly funded brownfield clean-ups by 50%. The sample program increases the number of sites cleaned-up per year to 115 sites. At an estimated cost of \$200,000 of public funding per site, this results in approximately \$23 million of public funding to support brownfield remediation per year, and \$690 million over 30 years.

Determining this estimate of the brownfield program’s cost is outlined in Table 4, below.

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<sup>2</sup> Paull, Evans. *The Environmental and Economic Impacts of Brownfields Redevelopment – working draft*. Northeast-Midwest Institute, July 2008. This forthcoming paper reviewed clean-up cost data from U.S. EPA on 271 sites, and estimated that clean-up costs for non-petroleum sites with land contamination are in the range of \$600,000-\$1M.

<sup>3</sup> “No Further Remediation” (NFR) letters are received when a site has been sufficiently cleaned-up to clear the property owner from liability. More information can be found in the strategy report, Section 3: Existing Policies and Programs.

<b>Table 4: Estimation of Brownfield Remediation Costs</b>		
<b>Measure</b>	<b>Source</b>	<b>Amount</b>
Median remediation cost for all sites	NEMW study <sup>2</sup>	\$800,000
Percentage of costs funded by the public sector (local, state, federal)	CMAP Brownfield Redevelopment Strategy Report <sup>4</sup>	25%
Estimated public sector costs to remediate sites		\$200,000
Average number of sites cleaned-up per year (using NFR letters)	IEPA database of NFR letters <sup>5</sup>	173
Percentage of sites receiving public funds	DeSousa paper, CMAP mini-survey <sup>6</sup>	45%
Estimated number of sites receiving some level of public funds per year		78
<b>Sample Program</b>		
Number of sites receiving some level of public funds per year		115
Public financing per year		\$23,000,000
Public financing cost for program (until 2040)		\$690,000,000

### 3. Determination of the impacts of remediating and redeveloping these brownfield sites.

A review of literature and interviews with local and national experts informed the strategy report's assessment of the impacts of brownfield redevelopment. Among other secondary and tertiary benefits, the main impacts of brownfield redevelopment are:

- Increase in land value;
- Creation of jobs and tax revenue; and
- Prevention of environmental and health impacts.

It is widely accepted that brownfield redevelopment has these benefits, and the strategy paper identified current research focused on quantifying them. This research pointed to an increase in the land value of remediated brownfield sites, no matter the location, as well as a "ripple" effect in which land value surrounding sites also saw an increase. There was evidence of an increase in tax revenue, as many of these sites are currently abandoned and tax-delinquent. Many reports describe an increase in permanent jobs, not just with the remediation and redevelopment work. Studies also identify the environmental and health benefits specifically due to the clean-up and removal of the contamination. Details about these impacts can be found in the strategy report (see [Section 4: Impacts](#)).

<sup>4</sup> A report done by the Illinois Institute for Rural Affairs (IIIRA) in 2005 was reviewed in detail for the preceding strategy paper (see Section 4: Impacts, Economic Impacts); it estimates ratios of public to private investment for 37 sites in Illinois. It estimated that \$.75 of every dollar invested in brownfield redevelopment is private, and \$.25 is public (\$.15 from local government, \$.06 from state, and \$.04 from federal). Therefore, it was assumed that 25% of brownfield redevelopment funding comes from the public sector.

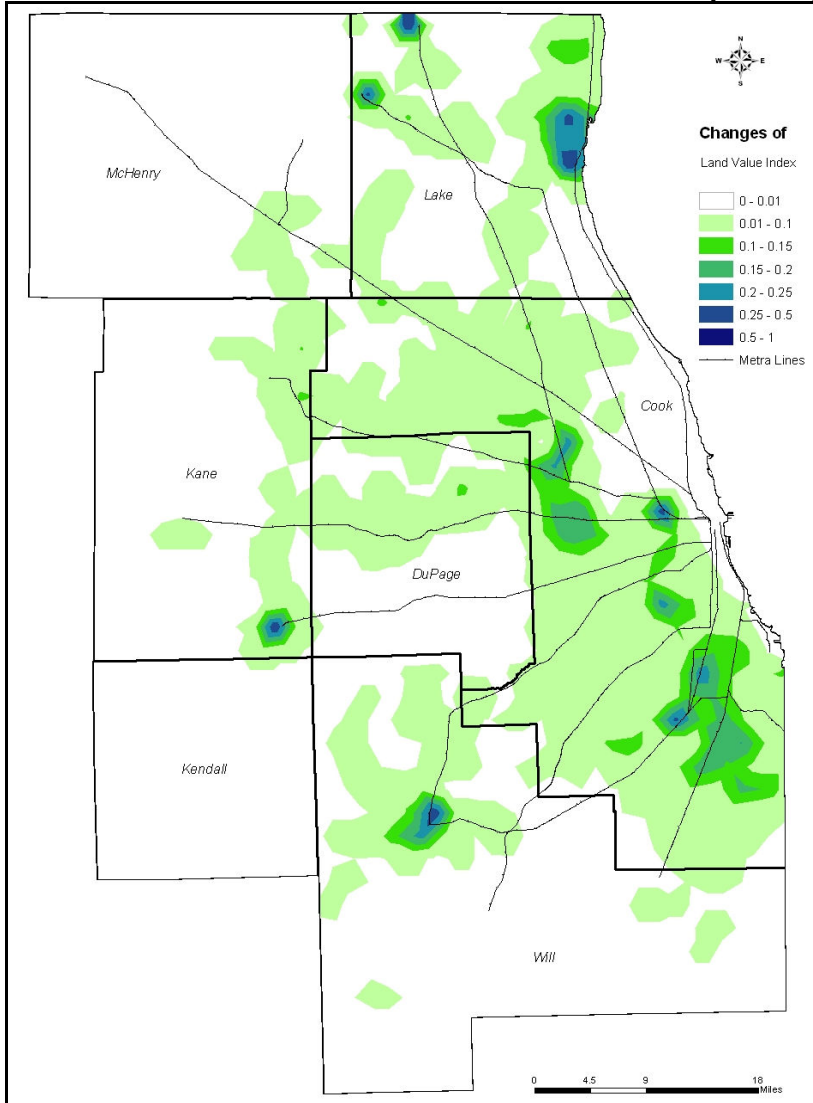
<sup>5</sup> Illinois EPA keeps data on NFR letters for sites within the SRP. The number of NFR letters received each year was averaged over the ten year period of data to determine an average yearly number of sites cleaned-up.

<sup>6</sup> DeSousa, C., "Residential Development Activity on Urban Brownfields in Milwaukee and Chicago: An Examination of Redevelopment Trends, Developer Perceptions, and Future Prospects," September 2006. This paper reviewed a representative sample of sites, finding that roughly 45% of sites are totally privately funded. A brief CMAP survey of NFR sites (in 2005) found that roughly 66% of sites were totally privately funded. Based on the average of these two findings, CMAP estimates of 55% of sites are privately funded, while 45% of sites receive some sort of public financial assistance.

It is intended that all of these impacts will be measured and modeled. However, the initial modeling tasks, which are reported in this section, were to determine the impact of the brownfield “program” on land value and the distribution of population and jobs.

A land value index (LVI)<sup>7</sup> was created for the region, by subzone. Based on the strategy paper, it was assumed that remediating a brownfield site would result in a 10% increase in the site’s land value. The change in LVI was also multiplied out to represent the probability that the change will impact surrounding subzones. The following map portrays the results.

**Map 4: Increase in Land Value Index with Brownfield Sample Program**



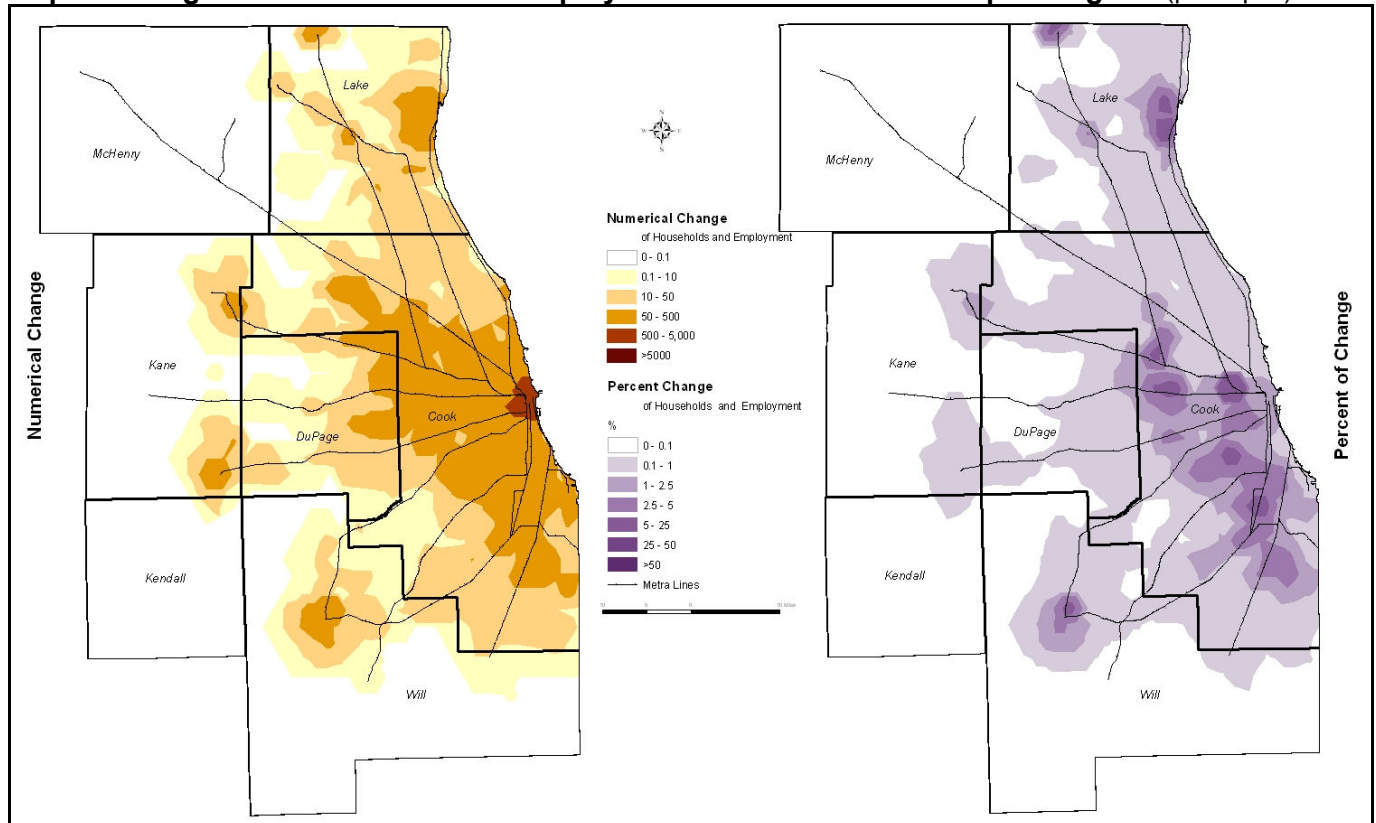
<sup>7</sup> The Land Value Index (LVI) used by CMAP is based on assessor’s data from each of the seven counties, obtained between 2006 and 2008. CMAP staff discovered, however, that underassessment was widespread, not only in Cook County, but all of the other counties in the region. CMAP staff have tried to adjust the land values of every parcel to 33% of market value, which is the assessment level mandated by the state in nearly every county. A report from the Illinois Dept of Revenue ([www.revenue.state.il.us/Publications/LocalGovernment/PtaxStats/2006AssessmentRatios.pdf](http://www.revenue.state.il.us/Publications/LocalGovernment/PtaxStats/2006AssessmentRatios.pdf)) estimates the ratio of assessed values to sales prices for properties in every township in the state. These ratios were used to increase the land values of parcels to roughly 33% of market value, thereby making land values more comparable throughout the region. Prior to this, mapped land values showed dramatic changes at some county borders; this was due to varying levels of underassessment in each county. The LVI has equalized land values across counties.



As the map reveals, there would be increases in the land value index in the areas targeted by the proposed brownfield remediation program – where the “eligible” brownfield sites exist. Land value in some areas would increase as much as 50%, due to high concentrations of brownfield sites.

In addition, the model was able to relate these results in land value to more tangible impacts – increases in homes and jobs in these areas. As described in the strategy report, there is evidence that brownfield remediation creates jobs, and consequently, population increase. Using the increase in LVI, the model was able to predict this change in activity in the targeted areas. This change in activity was modeled based on transportation accessibility, with both the brownfield subzone and those subzones with which it interacts showing changes. The following map portrays the results.

**Map 5: Changes of Households and Employment with Brownfield Sample Program (per sq mi)**



The map of the numerical increase (on the left) portrays how the number of jobs and households would increase in those areas with the highest concentration of eligible brownfields. It also takes into consideration the overflow effects of brownfield remediation, with the map showing how there would be widespread increases in jobs and households. The model predicts that the sample program would lead to development within the region's older, existing neighborhoods and communities. The map showing the percent change (on the right) highlights more specifically those areas which would see the largest change, most notably Joliet, Waukegan, and the near suburbs and neighborhoods south and west of downtown Chicago – older, industrialized areas with great potential for brownfield redevelopment.

In addition to a geographic distribution of impact, the model predicts approximately 67,000 new jobs and households moving into these targeted areas due to the sample program for brownfield remediation.

## Next Steps

With the stated assumptions, the brownfield remediation sample program will cost \$690 million (\$23 million per year), but result in 67,000 new households and jobs in targeted areas of the region. Understanding these benefits and costs is critical to developing viable plan recommendations for brownfield remediation.

However, this analysis is not complete, and there are several additional components which need to be considered:

- In addition to land value and associated increases in jobs and population, there are other indicators to be modeled and measured, such as how the sample program impacts local budgets, transportation, and the environment.
- With such an impact on population, it will be important to consider *where* these additional households are coming from. Will they be a part of the expected population increase for the region, or an addition to that?
- This analysis has not yet considered implementation, including who would be responsible, and whether the sample program is something that would replace, or supplement current brownfield remediation efforts.

These are all extremely important aspects of this strategy which need to be carefully explored and understood in the next steps of analysis.